Train Control Standards Update

PTC RSAC

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Presentation

- Requirements
- Standards - what we have to what we need to develop
- Work completed
- Cab electronics
- Other standards
- Plans

Requirements

- Functional Interoperability
- Minimum set of interfaces
- Maximize functionality
- Functional (not box level) Interchangeability on board
  - e.g. Flexibility on grouping of functions into physical devices
- Provide for software version control

Standards

Technology	Data

• RF Communications
    • Protocols
        • Spec 200 - Layers 3-6
    • Wide Area Technology
        • Spec 200 - Layers 1-3
        • **Others (APCO-P25; GSM-R)**
    • **Local Area**
        • **IEEE 802.11**
• **Transponder Interface**
• HMIs
    • M-591
    • ATCS Spec 320
 	
• Locomotive Platform
    • Architecture
        • **LSI (Modified) M590**
        • Eastern Project
    • Protocols
        • TCP/IP Ethernet
	• Data Dictionary
	    • ATCS Spec 250
	    • ISM/EDI
	    • Supplier Specs
	    • HMI Requirements
	• **Messages**

Management	**Performance**

• Configuration Management	• **Stimulus/Response**
	• RMA
	    • Industry Specs
	    • Supplier Specs
	• Operational
	    • Latency, Response Time
	        • Industry Specs
	        • Supplier Specs
	• Safety
	    • RSAC - RSPP/PSP
	    • ATCS Spec 140
	    • IEEE
	• Environmental
	    • ATCS Spec 110

Work Completed

- Developed Data Dictionary
- Progressed East Coast Project which will produce standards for interoperable systems onboard the locomotive and some off board as well
- Selected ATCS Specification 200 for upper layer RF protocols
- Wireless Communications Task Force focus group studying the scope of possible changes to ATCS protocol. WCTF will provide technical expertise on wireless communications to NAJPTC.
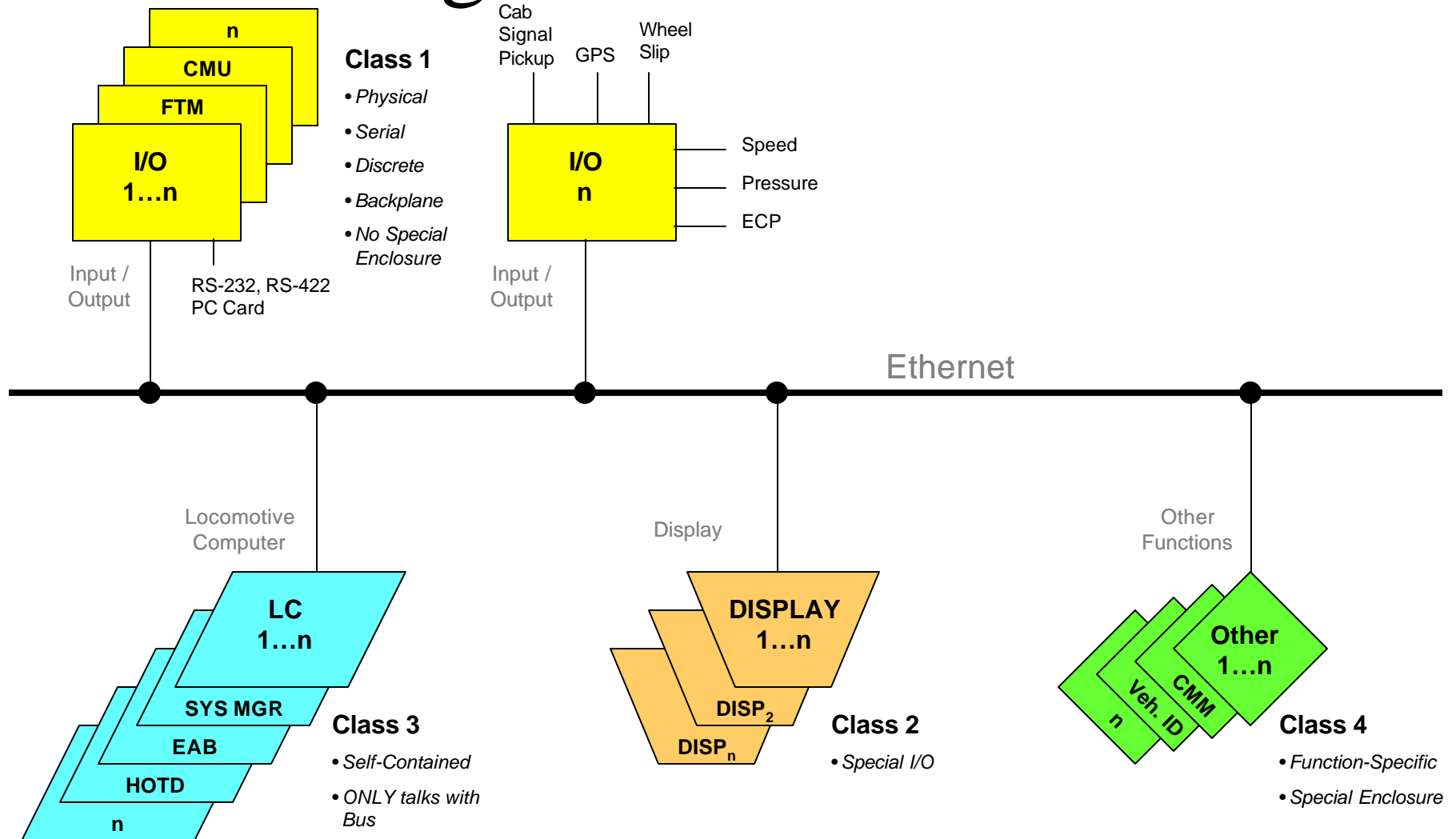
More Work Completed

- Formed a Railway Electronics Task Force to handle Configuration Management and development of AAR Electronic Standards (Section K of MSRP)
  - Initial MSRP issue includes: EOT, AEI and Configuration Management
  - On the docket are: M591 Operating Display, M590 LSI Architecture (as modified)

Next Generation Cab Electronics Standards

- Cab Electronics
  - Will build on AAR cab electronics standards (LSI) and modify them to take advantage of more up to date technology, includes a "communications management unit", which will
    - Develop functionality for "Communications Manager" which will allow for more independence for RF link
    - likely include high throughput link (e.g. 802.11)

Proposed Cab Electronics Logical Architecture

Class 1
- *Physical*
- *Serial*
- *Discrete*
- *Backplane*
- *No Special Enclosure*

n

CMU

FTM

I/O 1…n

Input / Output

RS-232, RS-422 PC Card

Cab Signal Pickup

GPS

Wheel Slip

I/O n

Speed

Pressure

ECP

Input / Output

Ethernet

Locomotive Computer

LC 1…n

SYS MGR

EAB

HOTD

n

Class 3
- *Self-Contained*
- *ONLY talks with Bus*

Display

DISPLAY 1…n

$DISP_2$

$DISP_n$

Class 2
- *Special I/O*

Other Functions

Other 1…n

CMM

Veh. ID

n

Class 4
- *Function-Specific*
- *Special Enclosure*

Messages

- Major area of effort on the part of Lockheed Martin
- Will leverage Cab Electronics and Eastern Project work
  - Object oriented architecture
- Use data elements in Data Dictionary
  - Plan to make this a part of Section K of the AAR Manual of Standards and Recommended Practices

Other Standards

- Industry Train Control Concept of Operations
- Addressing
  - Establishing databases for:
    - ATCS railroad numbers
    - IP addresses for APCO-P25 (really the onboard CMU)
    - End of train devices
    - APCO-P25 radios
    - Manufacturer codes

Plans

- Industry Concept of Operations
  - ARINC completed a survey of PTC functions
- Message development
  - Have worked with RETF and have scheduled a meeting for message development at ARINC on January 17-18, 2001
- LMC will develop System Design and Interface Design start next quarter and complete third quarter - input/feedback

More Plans

- Modify ATCS Specification 110, Environmental Requirements
- Continue to update NAJPTC documents through a configuration management process.
- Determine performance requirements as output of IDOT Project and Industry Concept of Operations as input into Train Control Standards
- Complete modification of M590